TEST REPORT

Electromagnetic compatibility (EMC) standard for radio equipment and services

Report Reference No.....:	422879-4TRFEMC	
Tested by (name, function and signature).....:	P. Barbieri	(project handler)
Approved by (name, function and signature).....:	D. Guarnone	(verifier)
Date of issue.....:	2021-05-31	
Testing Laboratory.....:	**Nemko Spa**	
Address .....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Testing location	Nemko Spa	
Address .....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy	
Applicant's name.....:	**Aesys SpA**	
Address .....:	Via Artigiani, 41 – 24060 Brusaporto (BG) – Italy	
Test specification:		
Standard .....:	ETSI EN 301 489-1 V2.2.3 – ETSI EN 301 489-3 V2.1.1 ETSI EN 301 489-17 V3.2.4 – ETSI EN 301 489-52 V1.1.2 ETSI EN 303 446-2 V1.2.1	
	Full application of the standards	☒
	Partial application of the standards	☐
Test procedure .....:	Nemko WM L0077, WM L0177 and WM L1002	
Test Report Form No.....:	301489TRFEMC	
TRF Originator.....:	Nemko Spa	
Master TRF.....:	2017-11	

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Test item description .....:	**Monitor**
Trade Mark .....:	aesys
Manufacturer .....:	Aesys SpA
Address of manufacturer .....:	Via Artigiani, 41 – 24060 Brusaporto (BG) – Italy
Code .....:	993202033501
Model name.....:	CPTOU4615 LS P1L3ARIO2HS24G1WTTSPFACZ0
Ratings .....:	220 – 240 V~, 50 / 60 Hz

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Test Report No. : 422879-4TRFEMC	2021-05-31 Date of issue

Short description of the EuT	Copy of marking plate
The E.U.T. a information monitor provided with an internal PC. The EUT use the following separatly approved radio module: - LTE/HSPA+/GSM module SIMCom model SIM7100E-PCIE - WIFI radio module Sparklan model WUBA-171GN - PMR radio module Elancitè model NF S32-002 - Antenna type Invax model DR70 The EUT is provided also with a slim soundbar code 993301701000 (Slim Soudbar 46" MC).	

Number of tested samples:	1
Serial number:	899707
Electromagnetic environment:	Industrial location
Emission classification:	Class A
Equipment classification:	Fixed equipment
Accessories and detachable parts included:	The E.U.T. is composed of a single unit
Other options included:	--

Testing

Date of receipt of test sample:	2021-05-13
Testing commenced on:	2021-05-17
Testing concluded on:	2021-05-28

Possible test case verdicts:

test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

Throughout this report point is used as decimal separator.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards on page 5	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
422879-4TRFEMC	First release	2021-05-31
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REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

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1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko
NEMKO WM L1002: Measurement Uncertainty - Policy and Statement
NEMKO WM L0077: General routines to perform EMC tests

ETSI EN 301 489-1 V2.2.3
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility

ETSI EN 301 489-3 V2.1.1
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

ETSI EN 301 489-17 V3.2.4
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility

ETSI EN 301 489-52 V1.1.2
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

ETSI EN 303 446-2 V1.2.1
ElectroMagnetic Compatibility (EMC) standard for combined and/or integrated radio and non-radio equipment; Part 2: Requirements for equipment intended to be used in industrial locations

The main standard(s) above contains references to other standards, which are listed below.

EN 55032 (2015)
Electromagnetic compatibility of multimedia equipment - Emission Requirements

EN 61000-4-2 (2009)
Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test.

EN 61000-4-3 (2006) + A1 (2008) + A2 (2010)
Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.

EN 61000-4-4 (2012)
Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.

EN 61000-4-5 (2014) + A1(2017)
Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.

EN 61000-4-6 (2014)
Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.

EN 61000-4-11 (2004)
Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.

2 SUMMARY OF TEST RESULTS

Harmonised Standard ETSI EN 301 489				
Technical Requirement Reference		Technical Requirement Conditionally		Verdict
No.	Description	U/C	Condition	
1	Emissions: Enclosure port	C	Only applicable to ancillary equipment not incorporated in the radio equipment.	P
2	Emissions: DC power input/output ports	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m or from a vehicle power supply	N
3	Emissions: AC mains power input/output ports	C	Only where equipment has AC mains power input and/or output ports	P
4	Emissions: Harmonic current emission (AC mains input port)	C	Only where equipment has AC mains power input ports	P
5	Emissions: Voltage fluctuations and flicker (AC mains input ports)	C	Only where equipment has AC mains power input ports	P
6	Emissions: Wired network ports	C	Only where equipment has wired network ports	P
7	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	U		P
8	Immunity: Electrostatic discharge	U		P
9	Immunity: Fast transients common mode	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m	P
10	Immunity: Radio frequency common mode	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m	P
11	Immunity: Transients and surges in the vehicular environment	C	Only where equipment is connected to vehicle power supply	N
12	Immunity: Voltage dips and interruptions	C	Only where equipment has AC mains power input ports	P
13	Immunity: Surges, line to line and line to ground	C	Only where equipment has AC mains power input ports and/or wired network ports	P

Symbols:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage:	☒	230 V / 50 Hz / 1ϕ	☐	230 V / 60 Hz / 1ϕ
	☐	400 V / 50 Hz 3PE	☐	400 V / 50 Hz 3NPE
	☐	12 V DC	☐	24 V DC

3.2 EuT operation modes

Mode	Description
1	Normal working displaying a video and a sound, and with all the radio modules linked

3.3 EuT Configuration modes

Emission: the EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

Immunity: the EuT was configured to have its highest possible susceptibility against tested phenomena. The test modes selected are according to EuT instruction manual.

Mode	Description
1	The EUT has been connected to the mains with the Ethernet cable connected to a PC. The WIFI radio module was connected to an access point. The LTE/HSPA+/GSM radio module was connected to a radio communication tester. The PMR radio module was controlled by an external remote control.

3.4 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	Enclosure	N/E	—	—	—
1	AC mains	AC	☒	☐	Three wires cable
2	Ethernet line	TP	☒	☒	Standard cable

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Ports TP = Telecommunication Ports ANT = Antenna Ports

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
AE	PC	—	—	—
AE	Radio communication tester	R&S	CMW 290	—
AE	PMR Remote control	Okeenea	TX1-BUZ	—
AE	IR Remote control	Meliconi	Speedy 2 combo	—
Note: * EUT - Equipment Under Test AE - Auxiliary/Associated Equipment (Not Subjected to Test) SIM - Simulator (Not Subjected to Test)				

3.6 Performance level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

☐	based on the used product standard
☒	based on the declaration of the manufacturer, requestor or purchaser

Performance criteria for ETSI EN 301 489-3

In the table below:

• performance criterion A applies for immunity tests with phenomena of a continuous nature;
• performance criterion B applies for immunity tests with phenomena of a transient nature.

Criterion	During test	After test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions

Performance criteria for ETSI EN 301 489-17

The performance criteria are:

• performance criteria A for immunity tests with phenomena of a continuous nature;
• performance criteria B for immunity tests with phenomena of a transient nature;
• performance criteria C for immunity tests with power interruptions exceeding a certain time.

Criteria	During test	After test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more).	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

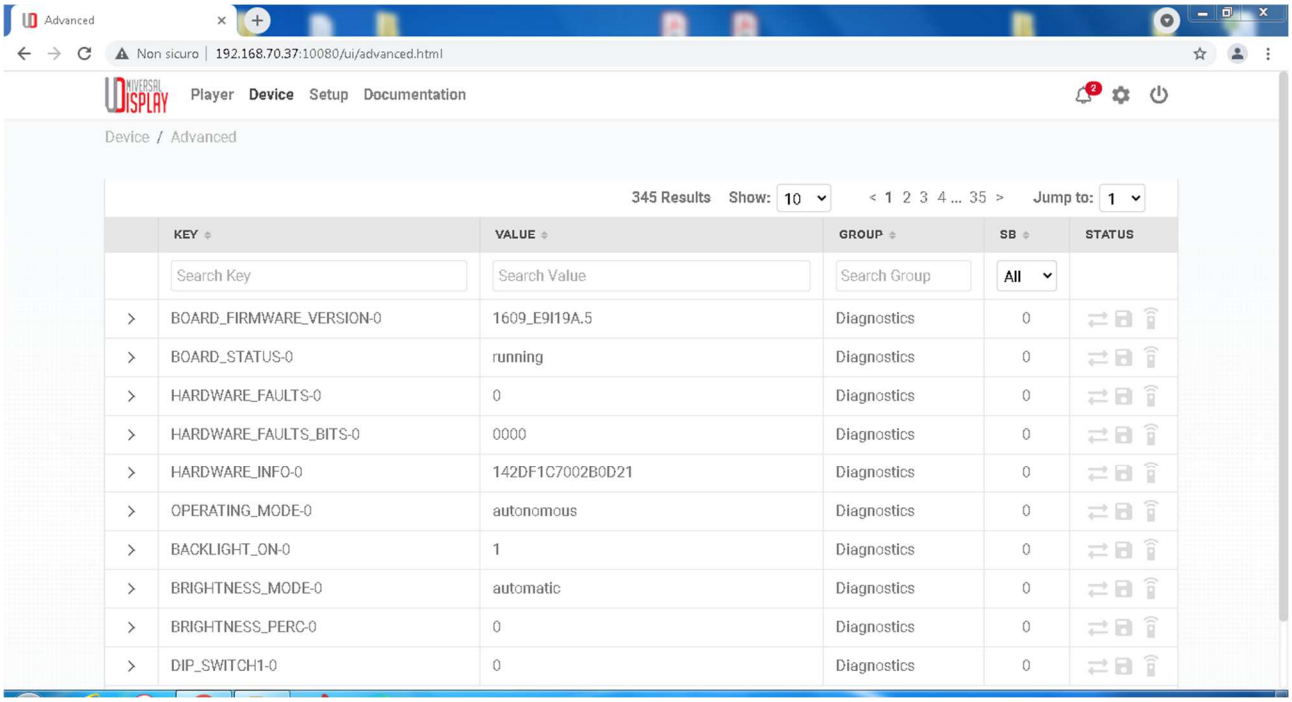
NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.
If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

Performance criteria for ETSI EN 301 489-52

The equipment shall meet the performance criteria specified in this clause and clauses 6.1.1 to 6.1.4 of ETSI EN 301 489-52, as appropriate. Portable equipment intended for use whilst powered by the main battery of a vehicle shall additionally fulfil the applicable requirements set out in ETSI EN 301 489-1, clauses 7.1 and 7.2 for mobile equipment. Portable or mobile equipment powered by the AC mains shall additionally fulfil the applicable requirements of ETSI EN 301 489-1, clauses 7.1 and 7.2 for radio and ancillary equipment for fixed use.

The establishment and maintenance of a communications link, the assessment of RXQUAL, and the assessment of the audio breakthrough by monitoring the speech output signal level, are used as performance criteria to ensure that all primary functions of the transmitter and receiver are evaluated during the immunity tests. In addition, the test shall also be performed in idle mode to ensure the transmitter does not unintentionally operate. The maintenance of a communications link shall be assessed using an indicator which may be part of the test system or the EUT. If an equipment is of a specialized nature, such that the performance criteria described in the following clauses are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in the following clauses.

The right work of the EUT has been check with the “ping” windows command and with a dedicated browser page (UDisplay – see the below). The PMR radio module has been check reproducing a vocal message after pressing a button on the remote control. Loss of link with radio module was not allowed. Distortion on the displayed video was not allowed.


Advanced
Non sicuro | 192.168.70.37:10080/ui/advanced.html
Player Device Setup Documentation
Device / Advanced
345 Results Show: 10 < 1 2 3 4 ... 35 > Jump to: 1
KEY VALUE GROUP SB STATUS
Search Key Search Value Search Group All
BOARD_FIRMWARE_VERSION-0 1609_E9I19A.5 Diagnostics 0
BOARD_STATUS-0 running Diagnostics 0
HARDWARE_FAULTS-0 0 Diagnostics 0
HARDWARE_FAULTS_BITS-0 0000 Diagnostics 0
HARDWARE_INFO-0 142DF1C7002B0D21 Diagnostics 0
OPERATING_MODE-0 autonomous Diagnostics 0
BACKLIGHT_ON-0 1 Diagnostics 0
BRIGHTNESS_MODE-0 automatic Diagnostics 0
BRIGHTNESS_PERC-0 0 Diagnostics 0
DIP_SWITCH1-0 0 Diagnostics 0

3.7 Exclusion band

According to clause 4.3 of ETSI EN 301 489-3.

According to clause 4.3 of ETSI EN 301 489-17.

According to clause 4.3 of ETSI EN 301 489-52.

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) – Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized under Nemko Spa testing engineer

4.2 Environmental conditions

In the laboratory, the following ambient conditions are respected for each test reported below:

Ambient temperature:	18 ÷ 33 °C (1)
Relative Humidity:	25 ÷ 70 % (2)
Atmospheric pressure:	860 ÷ 1060 hPa

(1) For luminaire, temperature during tests was verified to be within 18 ÷ 30 °C
(2) During ESD test, humidity was verified to be within 30 ÷ 60 %

The following instruments are used to monitor the environmental conditions:

Equipment	Manufacturer	Model	Serial N°
Thermo-hygrometer data loggers	Testo	175-H2	20012380/305
Thermo-hygrometer data loggers	Testo	175-H2	38203337/703
Barometer	Castle	GPB 3300	072015

4.3 Statement of the measurement uncertainty

The measurement uncertainty was calculated for each test and quantity listed in this test report, according to CISPR 16-4-2 and other specific test standard and is documented in Nemko Spa working manual WML1002.

The assessment of conformity for each test performed on the equipment is performed not taking into account the measurement uncertainty. The two following possible verdicts are stated in the report:

P (Pass) - The measured values of the equipment respect the specification limit at the points tested. The specific risk of false accept is up to 50% when the measured result is close to the limit.

F (Fail) - One or more measured values of the equipment do not respect the specification limit at the points tested. The specific risk of false reject is up to 50% when the measured result is close to the limit.

Hereafter Nemko's measurement uncertainties are reported:

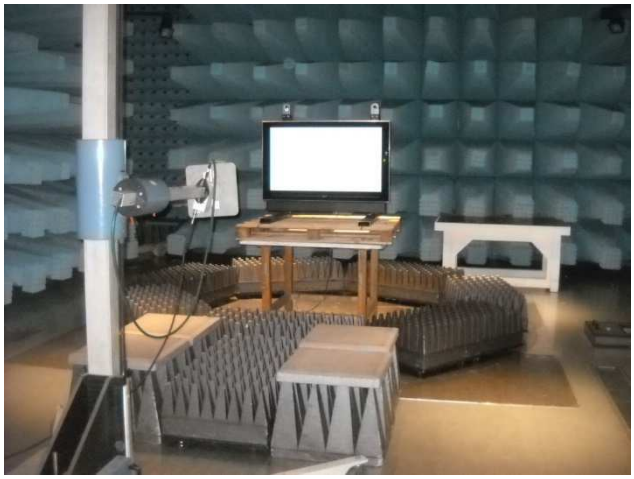
Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 10m Chamber	Antenna distance 3 m, 10 m 0.009 ÷ 200 MHz	5.0 dB	(1)
	Antenna distance 1 m, 3 m, 10 m 200 ÷ 1000 MHz	5.2 dB	(1)
	Antenna distance 1 m, 3 m, 10 m 1 ÷ 6 GHz	5.2 dB	(1)
	Antenna distance 1 m, 3 m 6 ÷ 18 GHz	5.5 dB	(1)
	Antenna distance 1 m, 3 m 18 ÷ 40 GHz	7.2 dB	(1)
Radiated Disturbance with large loop antenna system (LLAS)	0.009 ÷ 30 MHz	3.3 dB	(1)
Conducted Disturbance	0.02 ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	150 kHz ÷ 30 MHz with current probe	2.9 dB	(1)
Clicks	9 ÷ 150 kHz	3.8 dB	(1)
	150 kHz ÷ 30 MHz	3.4 dB	(1)
Disturbance Power	30 MHz ÷300 MHz	4.5 dB	(1)
Frequency	10 Hz ÷ 1 kHz	0.2 %	(1)
	1 kHz ÷ 40 GHz	10^{-6}	(1)
Harmonic Current Emission	50 Hz ÷ 2 kHz	3 %	(1)
Fluctuation and Flikers	Fluctuation	0.05 %	(1)
	Flikers	5 %	(1)
Radiated Immunity Anechoic Chambers	20 MHz ÷ 6 GHz	3.4 dB	(1) (3)
Radiated Immunity TEM Cell	0.01 ÷ 200 MHz	3.0 dB	(1) (3)
Bulk Current	1 ÷ 200 MHz	3.0 dB	(1)
Immunity to conducted disturbances	9 kHz ÷ 230 MHz	3.0 dB	(1)
ESD Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
Burst Immunity	Voltage, frequency, burst period and duration, rise time and pulse width	(2)	(1)
Surge Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
DIPS, Interruption and Voltage duration Immunity	Amplitude	5 %	(1)
	Duration	5 %	
Impulse Magnetic Field Immunity	Peak Current	10 %	(1) (3)
	Rise time, Duration	20 %	
Power Frequency Magnetic Field Immunity	16.7 Hz, 50 Hz, 60 Hz	2.0 dB	(1) (3)
Damped Oscillatory Wave Immunity Ring Wave Immunity	Voltage, front time, frequency 100 kHz, 1 MHz	(2)	(1)
Damped Magnetic Field	Amplitude: 100 kHz, 1 MHz	3 dB	(1)
	Frequency: 100 kHz, 1 MHz	10 %	
Low Frequency Immunity	15 Hz ÷ 150 kHz	2.2 dB	(1)
Automotive transients Immunity	Voltage, rise time, duration time Impulses 1, 2a, 2b, 3a, 3b and 4	(2)	(1)
Automotive transients Emission	Amplitude, Time	10 %	(1)
EMF for Lighting Equipment	-	25 %	(1)
Electromagnetic fields (EMF)	Magnetic, Electric and Electromagnetic fields: 0 Hz ÷ 40 GHz	25 %	(1)
Electrical quantities (voltage, current, resistance)	AC/DC Voltage 10 mV ÷ 1000 V 0÷100 kHz AC/DC Current 0.1 mA ÷ 400 A 0÷1 kHz Resistance 100 mΩ ÷ 10 MΩ	2.5 %	(1)

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for a normal distribution corresponds to a coverage probability of approximately 95 %
(2) The instruments used for this immunity test is according to the tolerances requested by the applicable standard
(3) The reported expanded uncertainty of measurement is related to the stimulus quantity

5 TEST CONDITIONS AND RESULTS

5.1 Radiated emission in the frequency range 30 MHz to 6 000 MHz

5.1.1 Photo documentation of the test set-up



5.1.2 Test method according to EN 55032

Measurements were made on a semi anechoic chamber. Preliminary measurements were performed at an antenna to EUT separation distance of 3 meters with the receive antenna located at a fixed height (from 1 to 4 meter) in both horizontal and vertical polarities. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

5.1.3 Limits for enclosure of ancillary equipment

Frequency (MHz)	QP Limit (dBµV/m)
30 TO 230	40
230 TO 1000	47

Frequency (MHz)	AV Limit (dBµV/m)	PK Limit (dBµV/m)
1000 TO 3000	56	76
3000 TO 6000	60	80

5.1.4 Test result

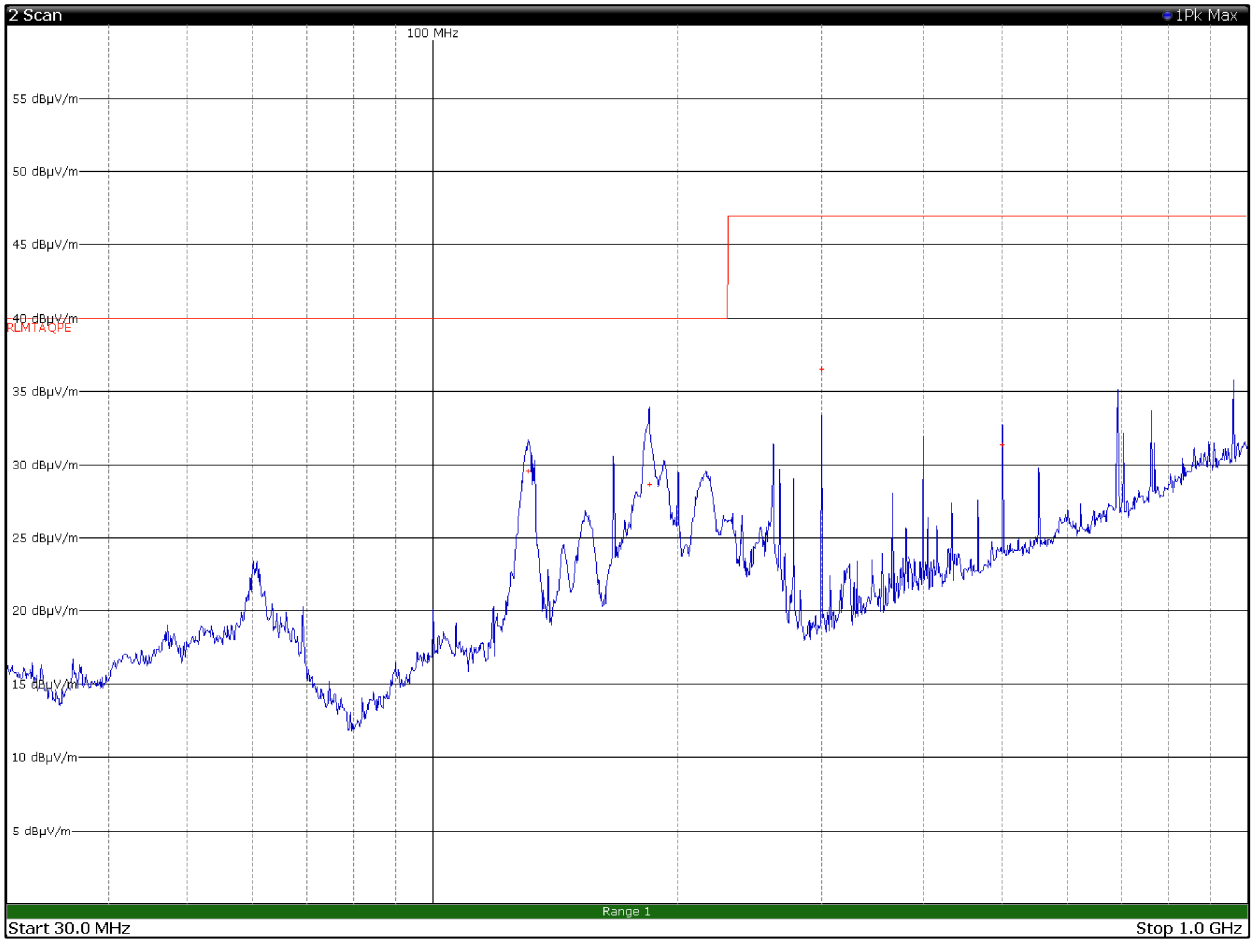
Verdict:	☒ P ☐ F ☐ N
Frequency range:	30 MHz – 6 000 MHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	10 m and 3 m
Remarks: The highest internal source of the EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. • If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. • If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. • If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. • If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.	

5.1.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148-123	123
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137
Controller	Maturo	FCU3.0	10041
Tilt antenna mast	Maturo	TAM4.0-E	10042
Turntable	Maturo	TT4.0-5T	2.527
Semi-anechoic chamber	Nemko	10 m semi-anechoic chamber	530
Shielded room	Siemens	10 m control room	1947

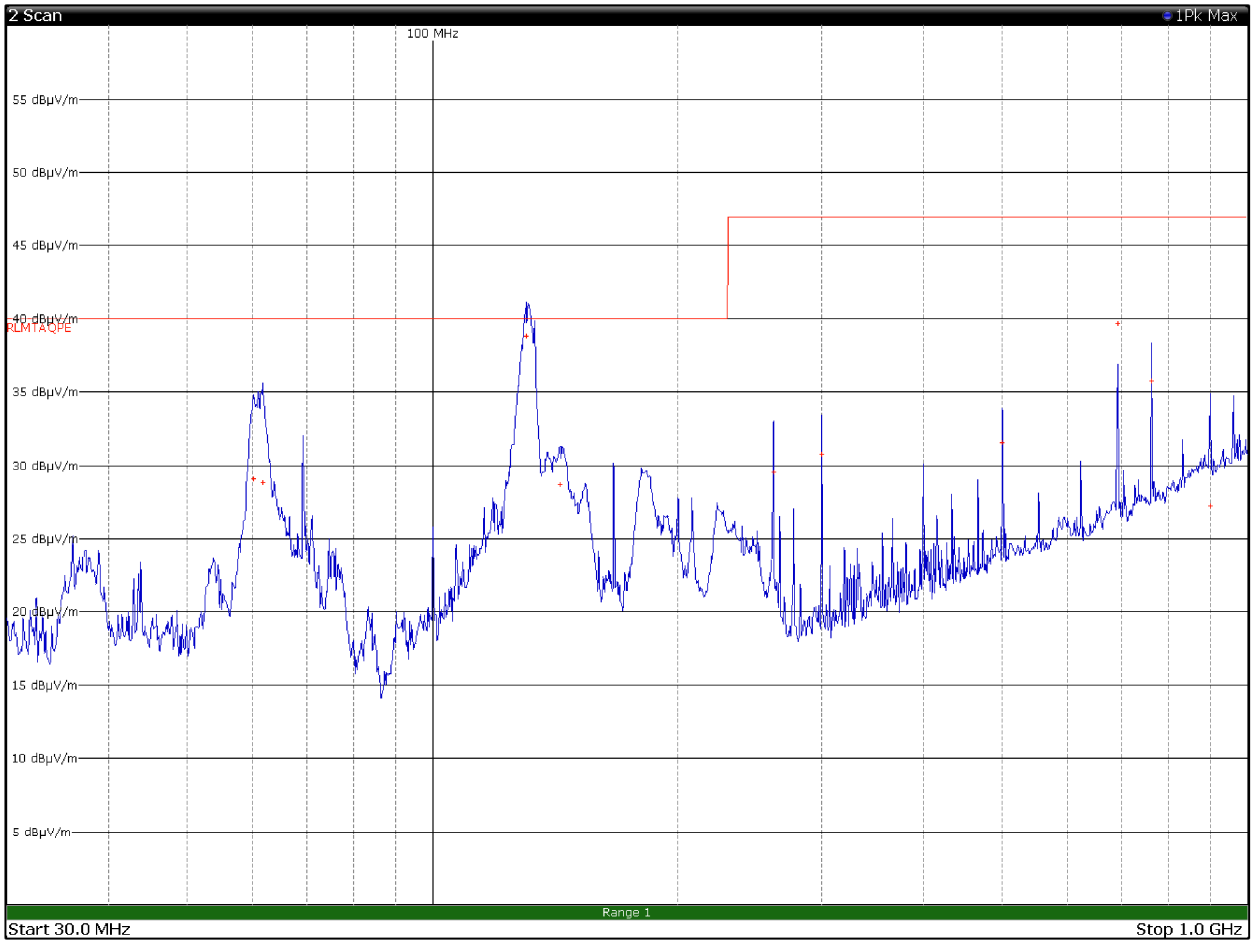
5.1.6 Test protocol

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 30 MHz to 1 GHz @ 10 m



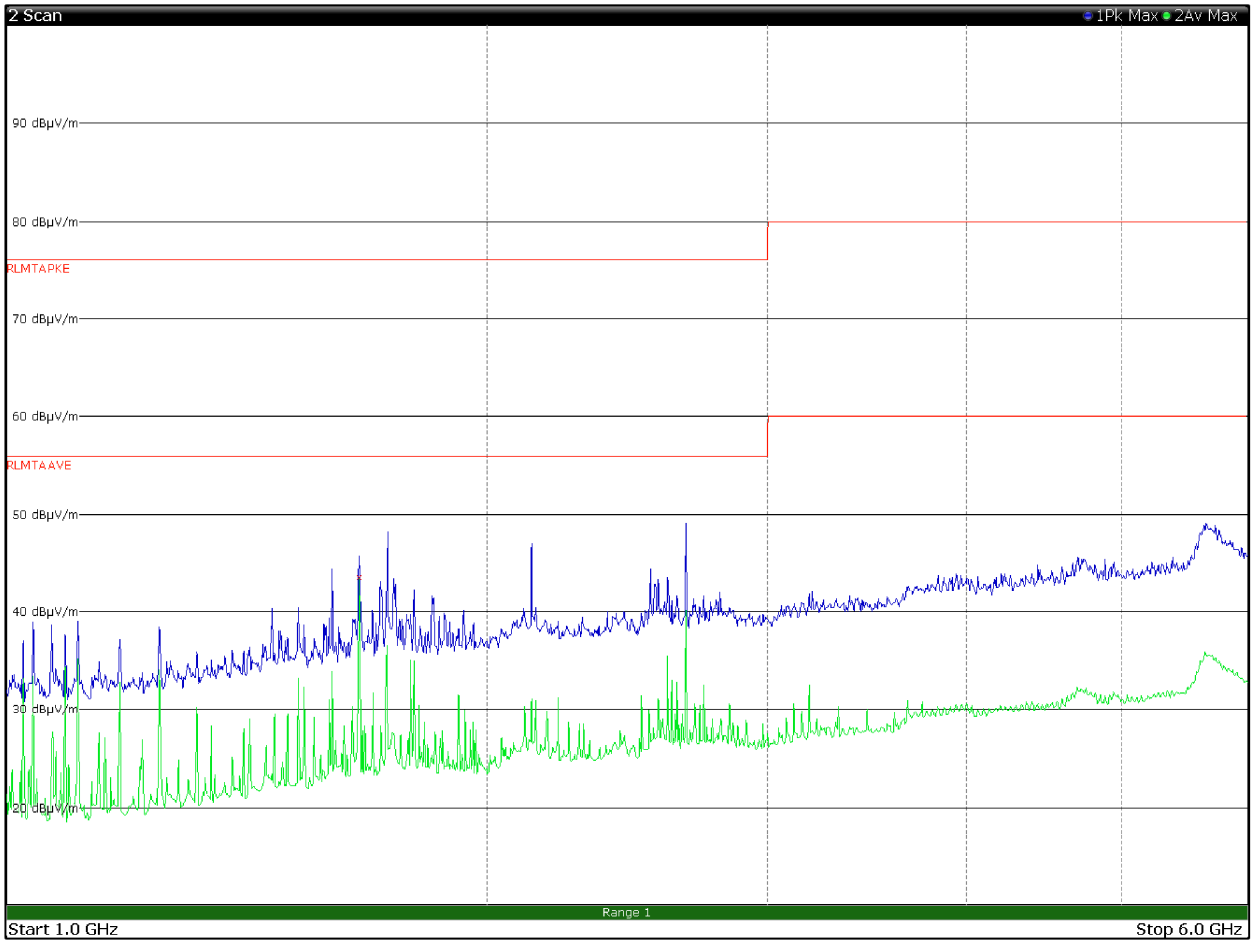
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
130.8600	29.6	40.0	-10.4	QP
184.3200	28.7	40.0	-11.3	QP
300.0000	36.5	47.0	-10.5	QP
500.0100	31.4	47.0	-15.6	QP

Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 30 MHz to 1 GHz @ 10 m



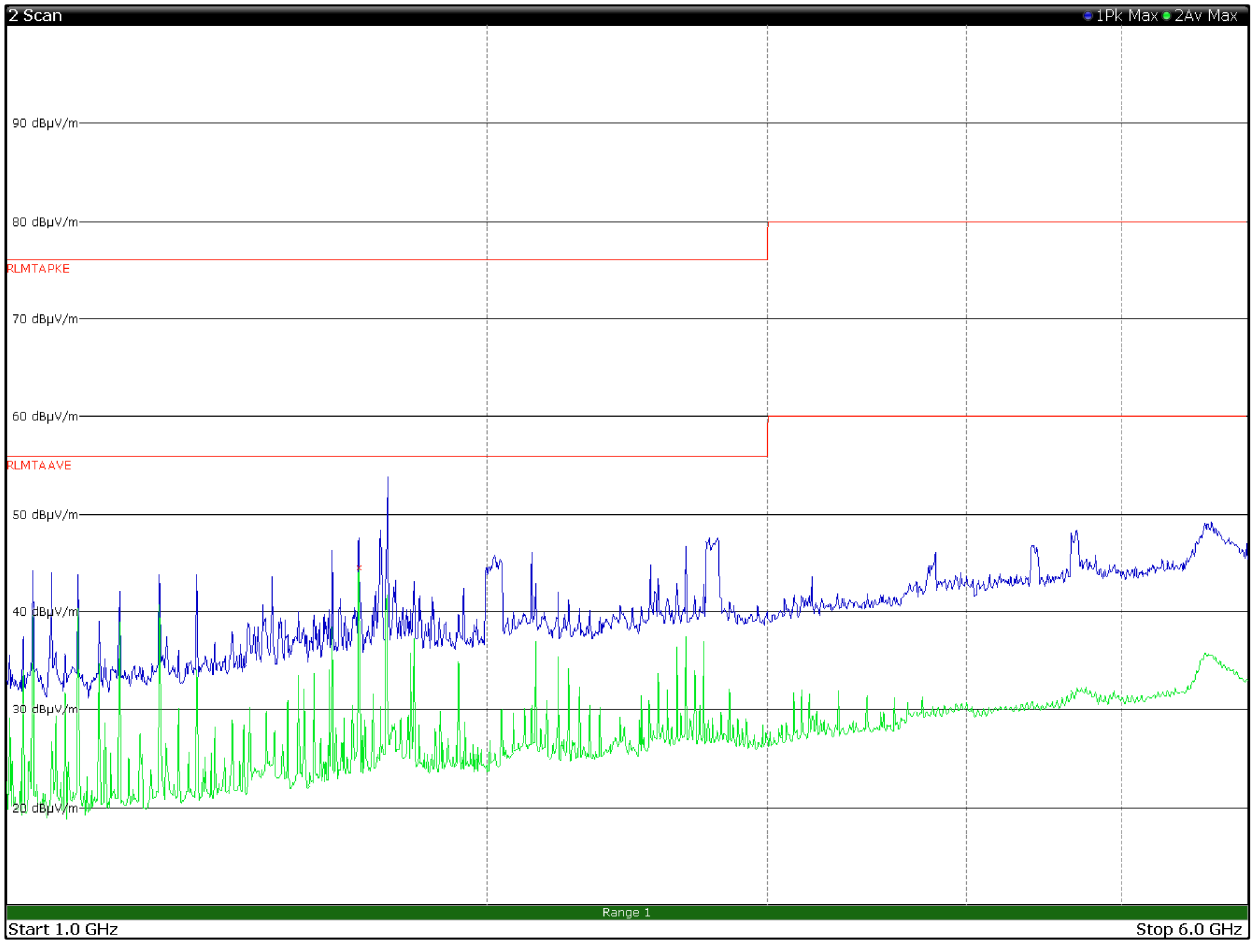
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
60.2700	29.1	40.0	-10.9	QP
61.8900	28.9	40.0	-11.1	QP
130.2900	38.8	40.0	-1.2	QP
143.0700	28.8	40.0	-11.2	QP
261.8400	29.6	47.0	-17.4	QP
300.0000	30.8	47.0	-16.2	QP
500.0100	31.6	47.0	-15.4	QP
692.3700	39.7	47.0	-7.3	QP
761.6700	35.8	47.0	-11.2	QP
900.1500	27.3	47.0	-19.7	QP

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 1 GHz to 6 GHz @ 3 m



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1664.0000	43.6	56.0	-12.4	Av

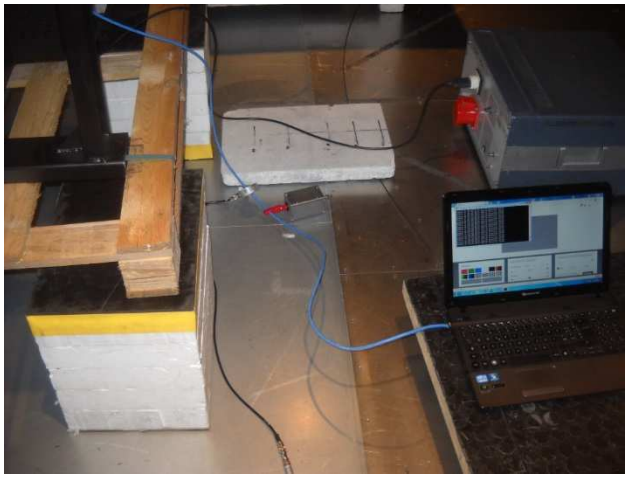
Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: Frequency range: 1 GHz to 6 GHz @ 3 m



Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
1662.0000	44.6	56.0	-11.4	Av

5.2 Conducted emission in the frequency range 150 kHz to 30 MHz

5.2.1 Photo documentation of the test set-up



5.2.2 Test method according to EN 55032

Measurements were made on a ground plane that extends one meter minimum beyond all sides of the system under test. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN. All tested telecommunications lines were connected to an Impedance Stabilization Network (ISN) and conducted voltage measurements on telecommunications lines were made at the output of the ISN. Where an ISN was not appropriate or available measurements were made using a Capacitive Voltage Probe and Current probe.

5.2.3 Limits for AC power input/output ports

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	79	66
0.50 TO 30	73	60

5.2.4 Limits for DC power input/output ports

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	79	66
0.50 TO 30	73	60

5.2.5 Limits for telecommunication port

Frequency (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0.15 TO 0.50	97 to 87*	84 to 74*
0.50 TO 30	87	74

*The limits decrease linearly with the logarithm of the frequency

Frequency (MHz)	Limit (dBµA)	
	Quasi-Peak	Average
0.15 TO 0.50	53 to 43*	40 to 30*
0.50 TO 30	43	30

*The limits decrease linearly with the logarithm of the frequency

5.2.6 Test result

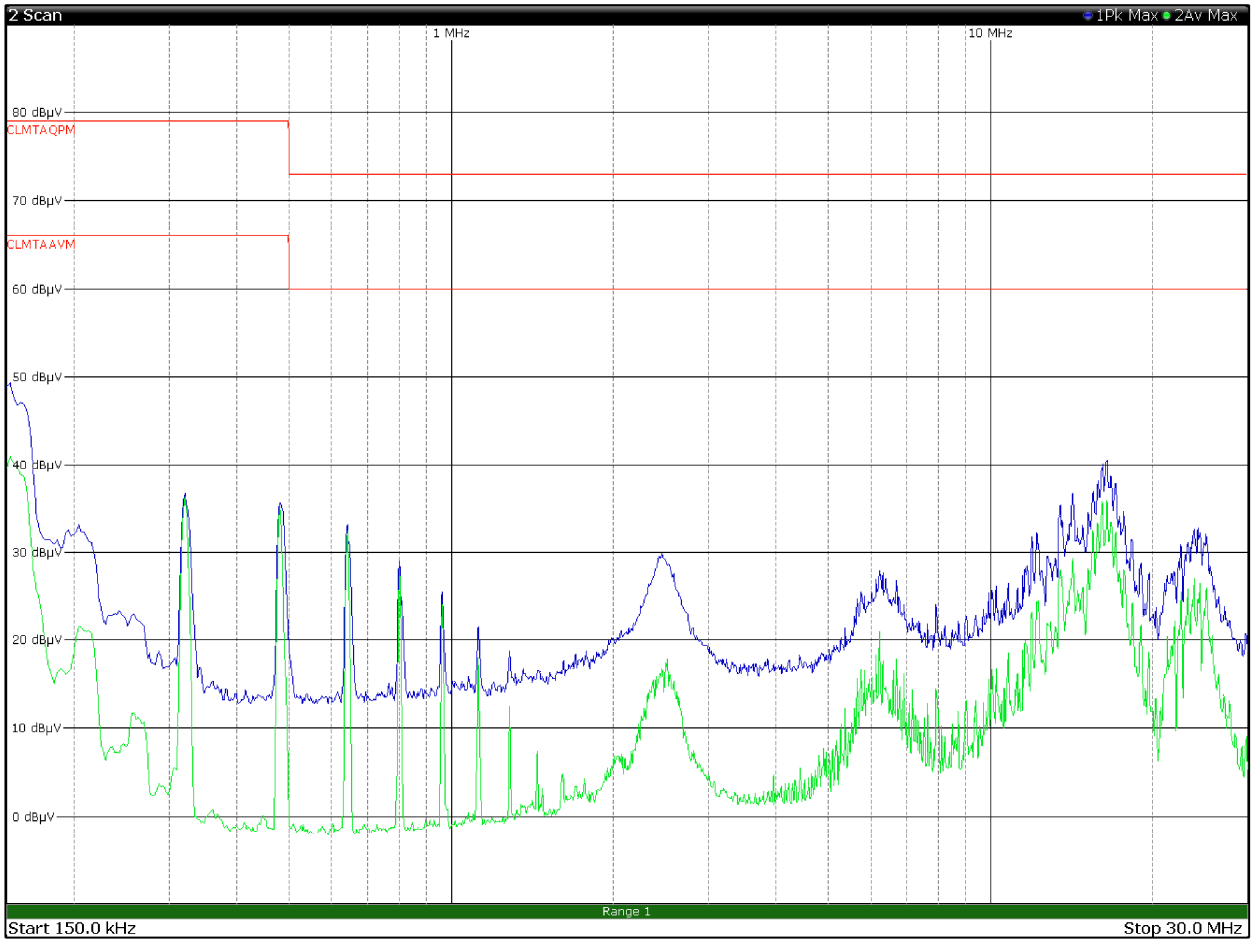
Verdict for AC mains input/output ports:	☒ P ☐ F ☐ N
Verdict for DC power input/output ports:	☐ P ☐ F ☒ N
Verdict for Wired network ports:	☒ P ☐ F ☐ N
Frequency range:	0.15 MHz – 30 MHz
Kind of test site:	Shielded room
Remarks:	

5.2.7 Test equipment used

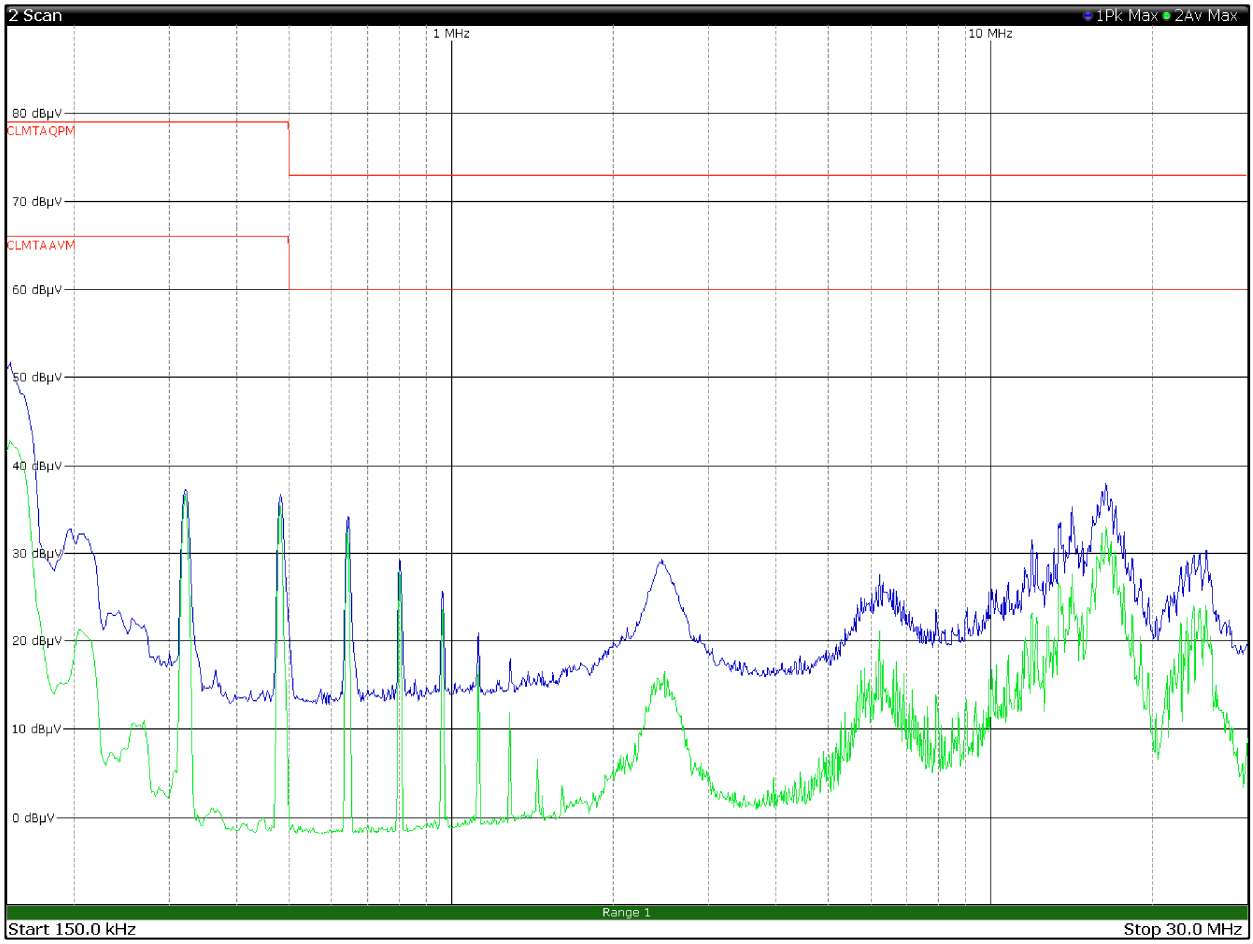
Equipment	Manufacturer	Model	Serial N°
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620
LISN 9 kHz ÷ 30 MHz	R&S	ESH2-Z5	872 460/041
Current clamp probe	R&S	ESH2-Z1	891 923/18
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.2.8 Test protocol

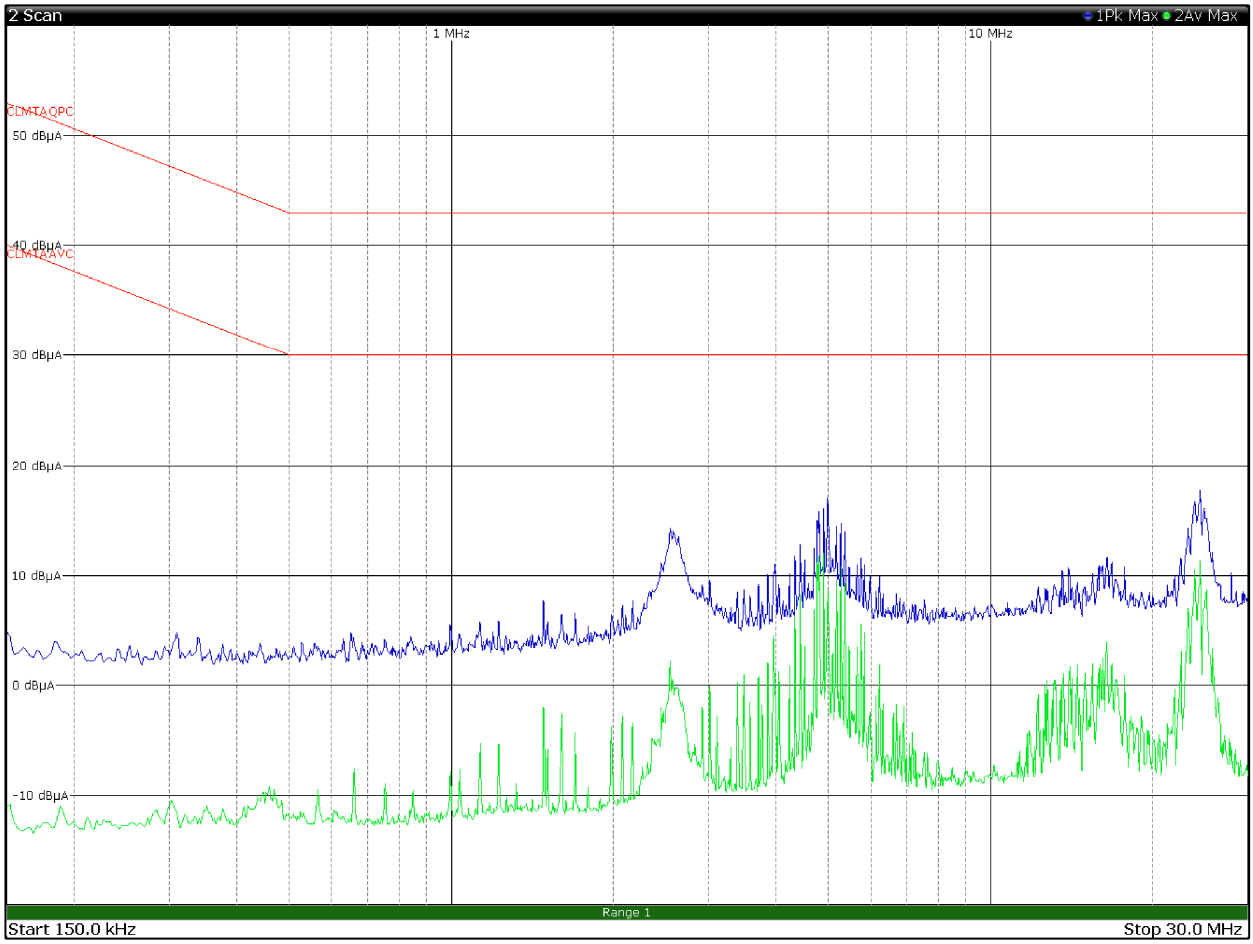
Test point:	Phase line	Verdict: Pass
Operation mode:	1	
Configuration mode:	1	
Remarks:	--	



Test point: Neutral line Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: --



Test point:	Ethernet line	Verdict: Pass
Operation mode:	1	
Configuration mode:	1	
Remarks:	--	



5.3 Harmonics of current

5.3.1 Photo documentation of the test set-up

5.3.2 Test method according to EN 61000-3-2

This test consists on the measurement of harmonics components of the input current which may be produced by equipment having an input current up to and including 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.

5.3.3 Limits for AC mains input port- Class A equipment

Harmonic order (n)	Maximum permissible harmonic current (A)
Odd harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15 ≤ n ≤ 39	0.15 x 15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
8 ≤ n ≤ 40	0.23 x 8/n

5.3.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	0 kHz – 2 kHz
Kind of test site:	Laboratory
Class:	☒ A
Remarks:	

5.3.5 Test protocol

Operation mode: 1 Verdict: Pass
Configuration mode: 1
Remarks: -

Urms =	230.3V	Freq =	50.016	Range:	2 A
Irms =	0.329A	Ipk =	0.597A	cf =	1.813
P =	41.18W	S =	75.79VA	pf =	0.543
THDi =	28.6 %	THDu =	0.10 %	Class A	

Test - Time : 5 min (100 %)

Test completed, Result: PASSED

Order	Freq. [Hz]	Iavg [A]	Irms [A]	Imax [A]	Limit [A]	Status
1	50	0.3160	0.3152	0.3302		
2	100	0.0331	0.0330	0.0347	1.0800	
3	150	0.0714	0.0714	0.0714	2.3000	
4	200	0.0000	0.0038	0.0039	0.4300	
5	250	0.0277	0.0276	0.0297	1.1400	
6	300	0.0000	0.0033	0.0034	0.3000	
7	350	0.0175	0.0175	0.0176	0.7700	
8	400	0.0000	0.0016	0.0020	0.2300	
9	450	0.0149	0.0149	0.0150	0.4000	
10	500	0.0000	0.0005	0.0006	0.1840	
11	550	0.0111	0.0111	0.0120	0.3300	
12	600	0.0000	0.0013	0.0013	0.1533	
13	650	0.0092	0.0092	0.0093	0.2100	
14	700	0.0000	0.0005	0.0007	0.1314	
15	750	0.0087	0.0088	0.0088	0.1500	
16	800	0.0000	0.0004	0.0005	0.1150	
17	850	0.0073	0.0073	0.0076	0.1324	
18	900	0.0000	0.0010	0.0010	0.1022	
19	950	0.0064	0.0063	0.0066	0.1184	
20	1000	0.0000	0.0004	0.0006	0.0920	
21	1050	0.0059	0.0059	0.0060	0.1071	
22	1100	0.0000	0.0005	0.0006	0.0836	
23	1150	0.0053	0.0052	0.0056	0.0978	
24	1200	0.0000	0.0004	0.0005	0.0767	
25	1250	0.0001	0.0048	0.0050	0.0900	
26	1300	0.0000	0.0002	0.0004	0.0708	
27	1350	0.0000	0.0046	0.0048	0.0833	
28	1400	0.0000	0.0005	0.0005	0.0657	
29	1450	0.0000	0.0044	0.0045	0.0776	

Order	Freq.	Iavg	Irms	Imax	Limit	Status
	[Hz]	[A]	[A]	[A]	[A]	
30	1500	0.0000	0.0004	0.0005	0.0613	
31	1550	0.0000	0.0038	0.0042	0.0726	
32	1600	0.0000	0.0004	0.0004	0.0575	
33	1650	0.0000	0.0038	0.0039	0.0682	
34	1700	0.0000	0.0004	0.0004	0.0541	
35	1750	0.0000	0.0035	0.0037	0.0643	
36	1800	0.0000	0.0005	0.0005	0.0511	
37	1850	0.0000	0.0032	0.0034	0.0608	
38	1900	0.0000	0.0004	0.0005	0.0484	
39	1950	0.0000	0.0033	0.0034	0.0577	
40	2000	0.0000	0.0005	0.0005	0.0460	

5.3.6 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Mains analyzer	EMC Partner	Harmonics 1000	016

5.4 Voltage changes, voltage fluctuations and flicker

5.4.1 Photo documentation of the test set-up

5.4.2 Test method according to EN 61000-3-3

This test consists on the measurement of voltage changes, voltage fluctuations and flicker which may be produced by equipment having an input current ≤ 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.

5.4.3 Limits for low voltage AC mains port – Class A equipment

The value of Pst shall be not greater than 1.0.
The value of Plt shall be not greater than 0.65.
The value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms.
The relative steady-state voltage change, dc shall not exceed 3.3 %.
The maximum relative voltage change dmax shall not exceed:

a) 4 % without additional conditions
b) 6 % for equipment which is switched manually, or switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption
c) 7 % for equipment which is attended whilst in use (for example : hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as mowers, portable tools such as electric drills), or switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

5.4.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency:	50 Hz
Kind of test site:	Laboratory
Remarks:	

5.4.5 Test protocol

Operation mode: 1 Verdict: Pass
Configuration mode: 1
Remarks: -

Urms =	230.3V	Freq =	50.031	Range:	2 A
Irms =	0.327A	Ipk =	0.596A	cf =	1.821
P =	41.13W	S =	75.34VA	pf =	0.546

Test - Time : 1 x 10 min = 10 min (100 %)

LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

Limits :	Plt :	0.65	Pst :	1.00
	dmax :	4.00 %	dc :	3.00 %
	dtLim:	3.00 %	dt>Lim:	200ms

Test completed, Result: PASSED

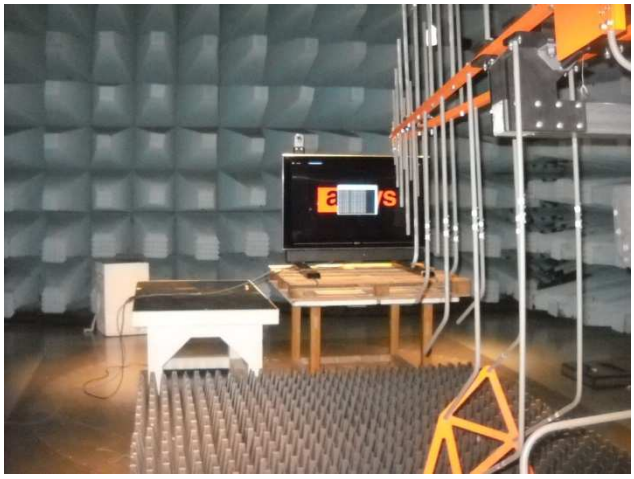
	Pst	dmax [%]	dc [%]	dt>Lim [ms]
1	0.072	0.000	0.010	0.000

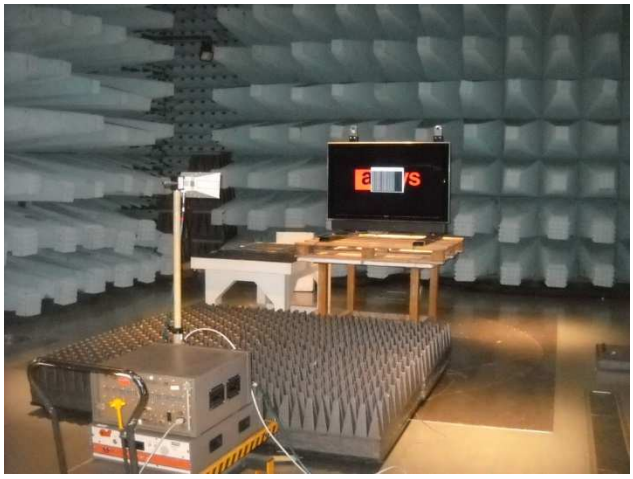
5.4.6 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Mains analyzer	EMC Partner	Harmonics 1000	016

5.5 Radio frequency electromagnetic field immunity test

5.5.1 Photo documentation of the test set-up





5.5.2 Test method according to EN 61000-4-3

The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80 MHz to 6000 MHz. The interference is applied on the enclosure of the equipment by using transmitting antennas. Measurements are made in a fully anechoic chamber and the indicated field strength is pre-calibrated prior to placement of the system under test.

5.5.3 Test specification

Frequency range:	80 MHz to 1000 MHz		1000 MHz to 6000 MHz	
Field strength:	10 V/m		3 V/m	
EuT - antenna separation:	3 m			
Modulation:	AM with 80 % in depth and 1 kHz sine wave			
Frequency step:	1 % with 2 s dwell time			
Antenna polarisation:	horizontal		vertical	
Antenna position:	front	rear	left	right

Spot frequency test for ETSI EN 301 489-19:
A spot frequency test shall additionally be performed at 80 MHz, 104 MHz, 136 MHz, 165 MHz, 200 MHz, 260 MHz, 330 MHz, 430 MHz, 560 MHz, 715 MHz ± 1 MHz, a spot frequency test shall be performed at 920 MHz ± 1 MHz using a test level of 3 V/m (measured unmodulated) 100 % modulated by 200 Hz pulses of equal mark to space ratio.

5.5.4 Test result

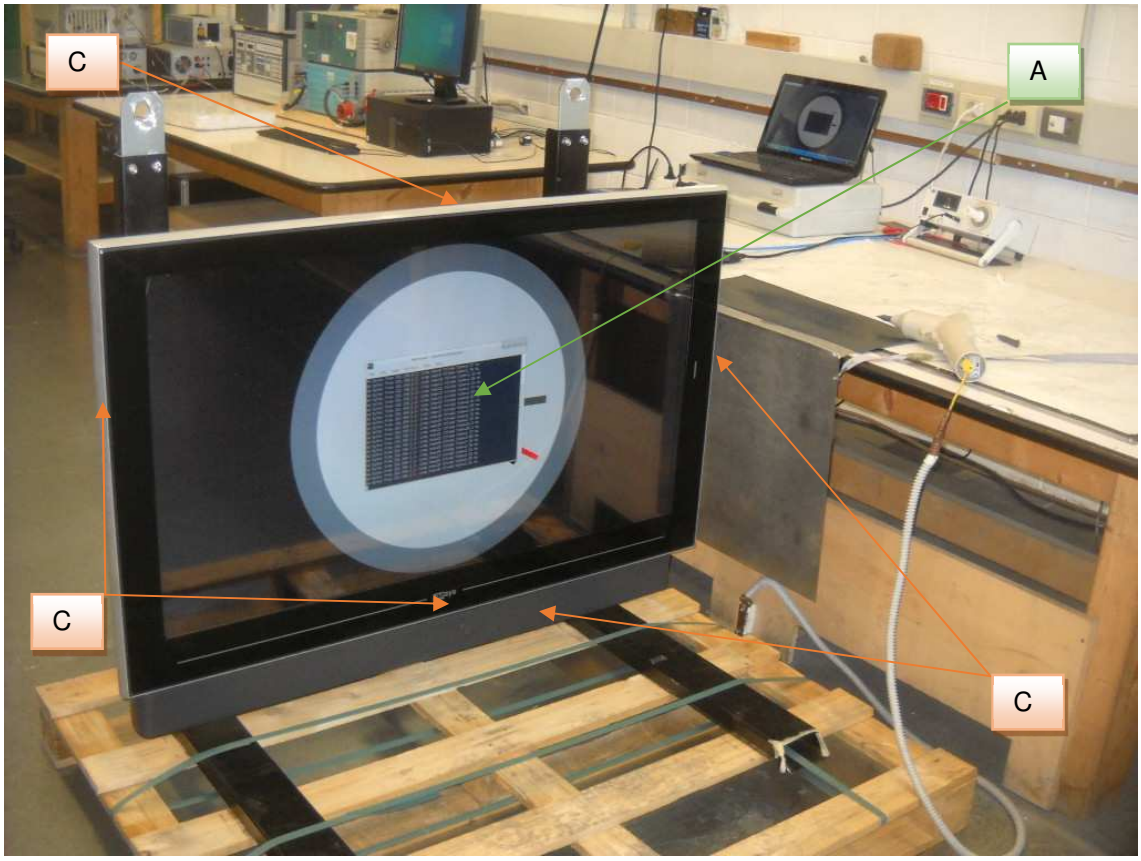
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Anechoic chamber
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

5.5.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Log periodic antenna (20 ÷ 6000 MHz)	AR	AT6026A	0330878
Microwave horn antenna (1 ÷ 18 GHz)	Schwarzbeck	BBHA 9120 D	D1874
RF generator (0.1 ÷ 12750 MHz)	R&S	SMB100A	180431
RF Amplifier (10KHz ÷ 225MHz)	AR	1000A225	0336745
RF Amplifier (200 MHz÷1000 MHz)	IFI	CMX100010-SMCC1000	L448A-0108
RF amplifier (0.8 ÷ 4.2 GHz)	AR	50S1G4A	301049
Broadband amplifier (4.2 ÷ 18 GHz)	AR	20T4G18	300792
Bidirectional Coaxial coupler	AR	DC7144	301249
Power sensor	R&S	NRP18AN	100990
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.6 Electrostatic discharges immunity test

5.6.1 Photo documentation of the test set-up



C = Contact discharge – A = Air discharge

5.6.2 Test method according to EN 61000-4-2

The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The table-top equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP) is placed on the table. The EUT and the cables are isolated from the coupling plane by an insulating support 0.5 mm thick. The floor standing equipment is isolated from the ground reference plane by an insulating support about 0.1 m thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT. Air discharges are applied to non-metallic parts of the system. Contact discharges are applied to all accessible metallic parts. Discharges are also applied to the Horizontal and Vertical Coupling Planes.

5.6.3 Test specification

Contact discharge voltage:	4 kV	
Air discharge voltage:	8 kV	
Discharge impedance:	330 Ω / 150 pF	
Time between successive discharges:	≥ 1 s	
Number of discharges:	≥ 10	
Type of direct discharge:	air discharge	contact discharge
Type of indirect discharge:	contact discharge	
Polarity:	positive	negative

5.6.4 Test result

Discharge location	Type of discharge
Horizontal coupling plane (HCP)	Contact
Vertical coupling plane (VCP)	Contact
Enclosure	Contact
Display	Air

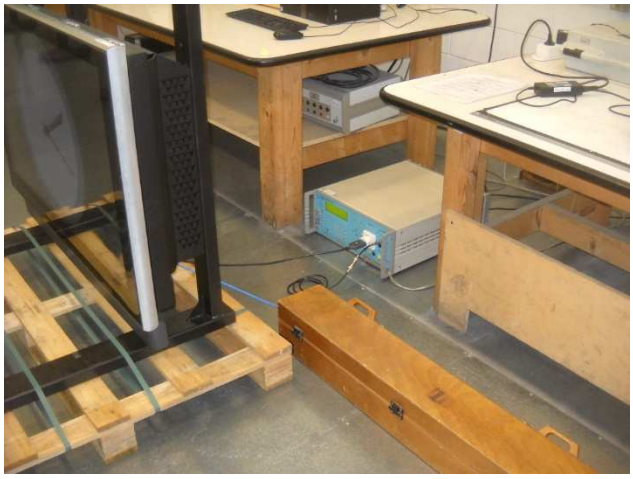
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

5.6.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
ESD Test system	EMC Partner	ESD3000	252

5.7 Fast transients, common mode immunity test

5.7.1 Photo documentation of the test set-up



5.7.2 Test method according to EN 61000-4-4

The test is intended to demonstrate the immunity of equipment subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce….). The bursts are applied on the mains supply port by using a coupling decoupling network and on signal and control lines ports by using a capacitive clamp. Measurements are made on a ground plane.

5.7.3 Test specification

Voltage level for AC mains power port:	2 kV	
Voltage level for DC power ports:	2 kV	
Voltage level for signal ports, wired network ports, control ports:	1 kV	
Burst frequency:	5.0 kHz	
Coupling duration:	≥ 60 s	
Polarity:	positive	negative

5.7.4 Test result

Coupling point	Level	Coupling devices	Verdict
AC mains	± 2 kV	Network	P
Ethernet line	± 1 kV	Clamp	P

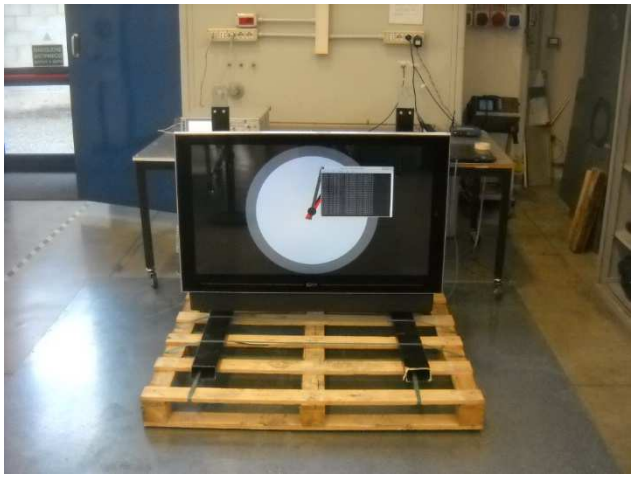
Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

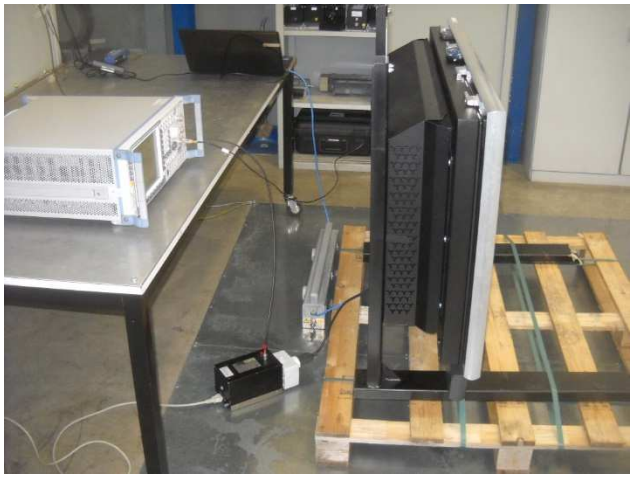
5.7.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849
Coupling clamp	Schaffner	CDN 125	245 9219

5.8 Radio frequency, common mode immunity test

5.8.1 Photo documentation of the test set-up





5.8.2 Test method according to EN 61000-4-6

The test allows estimating of the conducted immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 150 kHz to 80 MHz. The interference is applied on mains supply, signal line and earth connection ports by using coupling decoupling networks or a clamp. Measurements are made on a ground plane. The EUT was located 10cm above the reference ground plane and any associated I/O cables attached to the EUT are located between 30mm and 50mm above the ground plane. The indicated field is pre-calibrated prior to placement of the system under test.

5.8.3 Test specification

Frequency range:	0.15 MHz to 80 MHz
Test voltage:	10 V
Modulation:	AM with 80 % in depth and 1 KHz sine wave
Frequency step:	1 % with 2 s dwell time

5.8.4 Test result

Coupling point	Coupling and decoupling devices	Verdict
AC mains	M3	P
Ethernet line	EM-CLAMP	P

Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, only change of the fans speed occurs.	

5.8.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Coupling/decoupling network	EM Test	CDN M2/M3	0307-16
EM injection clamp	FCC	F203I-23mm	121239
RF Conducted immunity test equipment	EM Test	CWS500 CSI	V0710102305
Attenuator 6dB	EM Test	ATT6/75	0206-18
Shielded room	Siemens	Conducted immunity test room	68

5.9 Voltage dips and interruptions immunity test

5.9.1 Photo documentation of the test set-up

5.9.2 Test method according to EN 61000-4-11

The test allows estimating of the conducted immunity of electrical and electronic equipment connected to low-voltage power supply networks for voltage dips and short interruptions. Testing is performed with the product connected directly to a generator capable of simulating the voltage drops and interrupts as described.

5.9.3 Test specification

Nominal Mains Voltage	230 Vac
Rated frequency	50 Hz
Number of voltage dips and interruptions	3
Sync Angle	0°

Changes to occur at 0 degree crossover point of the voltage waveform.

5.9.4 Test result

	Level of reduction	Residual voltage	Duration	Performance criterion	Verdict
1	100%	0%	0.5 period	B	P
2	100%	0%	0.5 period	B	P
3	30%	70%	25 periods	See remarks	P
4	100%	0%	250 periods	B	P

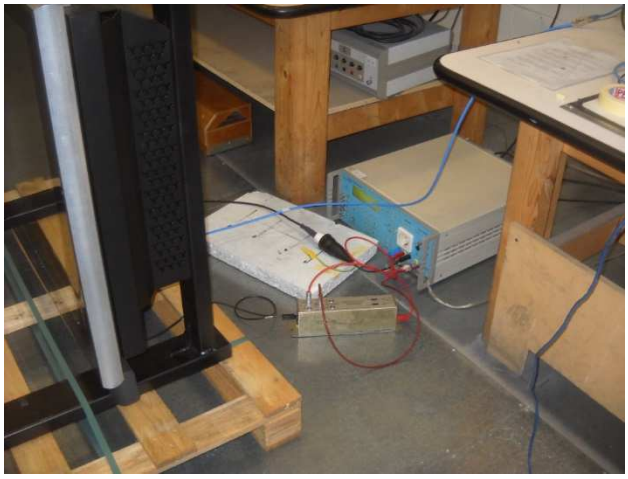
Verdict:	☒ P ☐ F ☐ N
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: in the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena for transmitters or for receivers shall apply. in the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator. No unintentional responses shall occur at the end of the test. Remarks: the performance criterion achieved during test was A, nothing happened during test, except for test 4 in which the EUT switch off.	

5.9.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849

5.10 Surge immunity test

5.10.1 Photo documentation of the test set-up



5.10.2 Test method according to EN 61000-4-5

The test allows estimating of the conducted immunity of electrical and electronic equipment to unidirectional surges caused by over voltages from switching and lighting transients. The interference is applied on symmetrical and unsymmetrical modes on mains supply port by using coupling decoupling network. Five positive surges and five negative surges are applied at each of phases of the a.c. waveform: 0°, 90°, 180° and 270°. Each surge was applied 60 seconds after the previous surge. Signal and Telecommunications ports were subject to five positive and five negative surges applied through the appropriate Coupling/Decoupling Network (CDN).

5.10.3 Test specification for Input AC power port

Pulse amplitude for line to line surge:	1 kV			
Pulse amplitude for line to earth surge:	2 kV			
Number of surges:	5 surges/phase angle			
Phase angle:	0°	90°	180°	270°
Repetition rate:	60 s			
Rise time:	1.2 µs			
Time to half value:	50 µs			
Polarity:	positive		negative	

5.10.4 Test specification for wired network ports

Pulse amplitude for line to earth surge:	1 kV	
Number of surges:	5 surges/polarity	
Repetition rate:	60 s	
Rise time:	1.2 µs	
Time to half value:	50 µs	
Polarity:	positive	negative

5.10.5 Test result

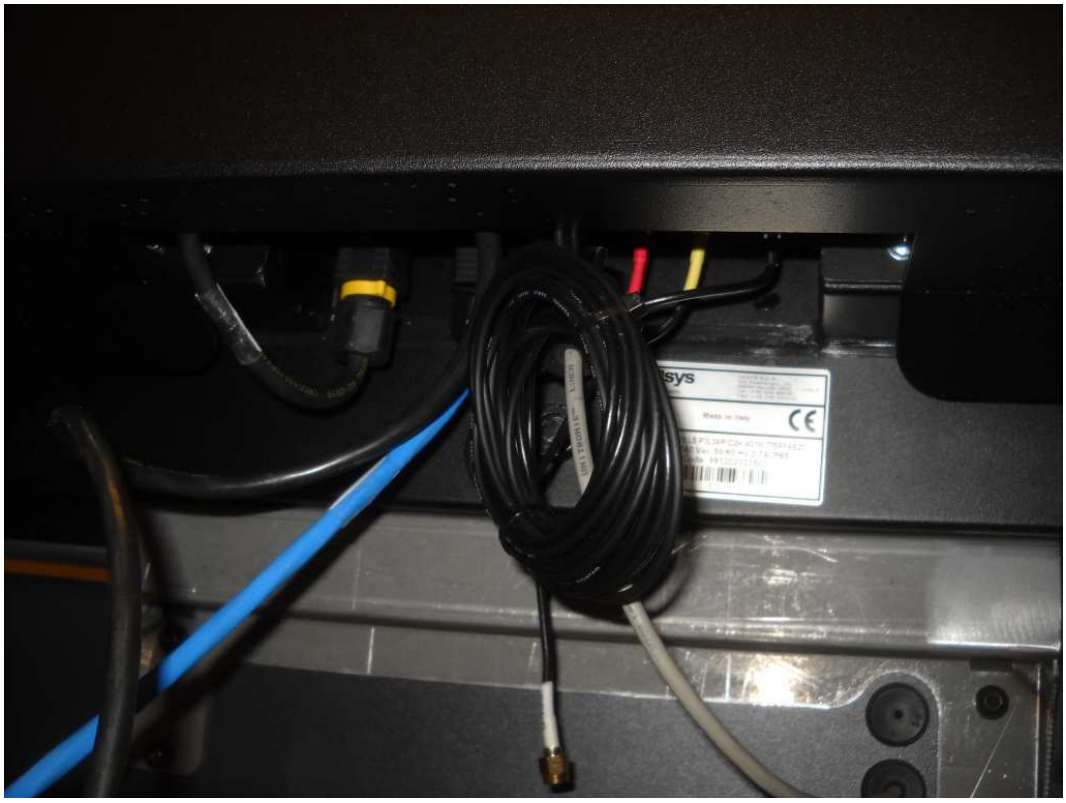
Coupling point	Coupling type	Level	Coupling network	Verdict
AC mains	line to line	1 kV	2 Ω + 18µF	P
AC mains	line to earth	2 kV	12 Ω + 9µF	P
Signal port	shield to earth	1 kV	Direct on the shield	P

Verdict:	☒ P ☐ F ☐ N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks: the performance criterion achieved during test was A, nothing happened during test.	

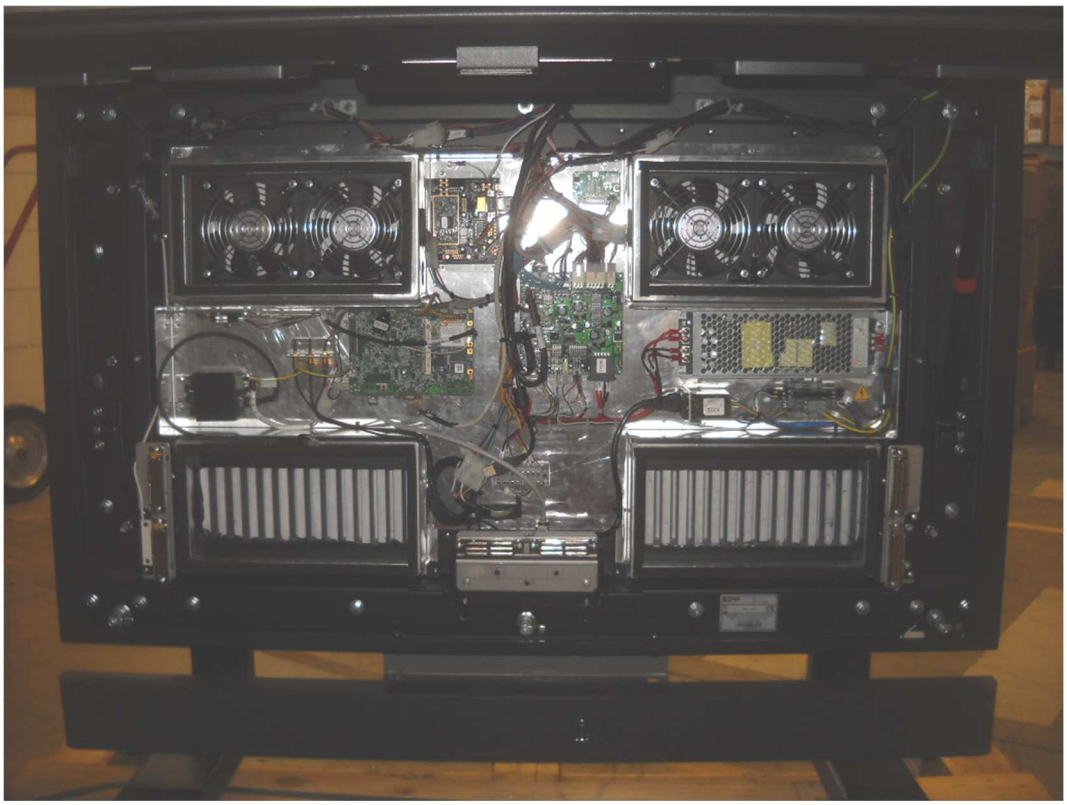
5.10.6 Test equipment used

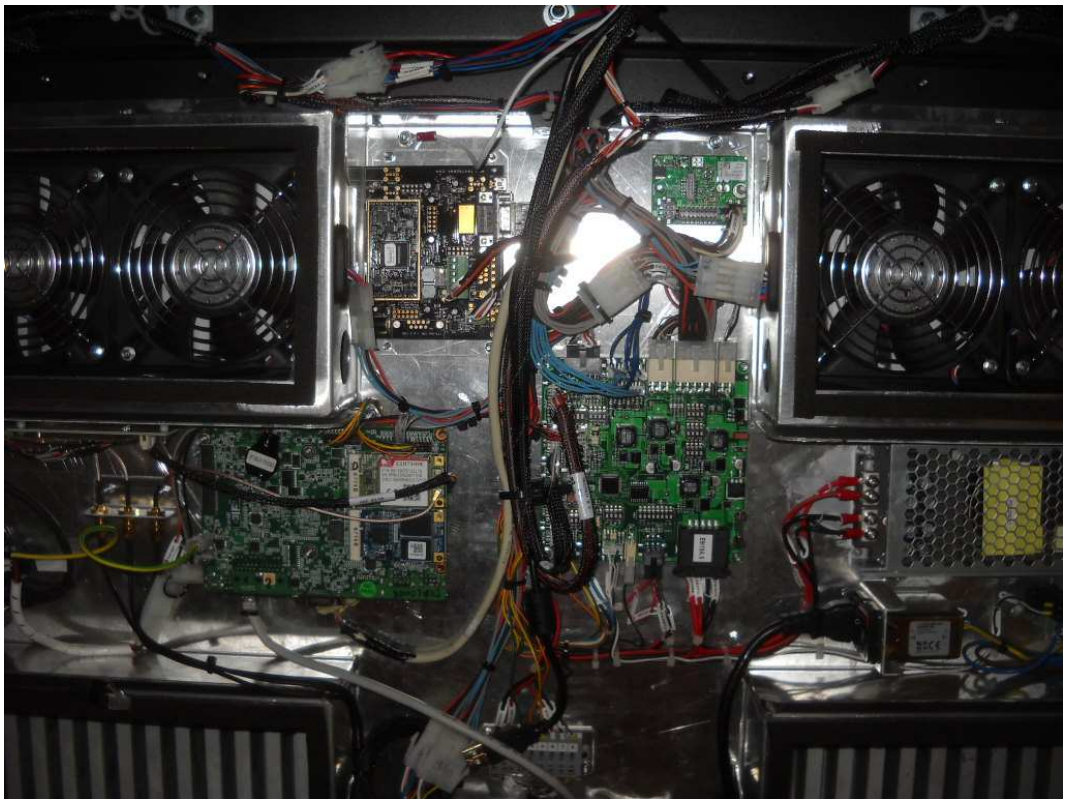
Equipment	Manufacturer	Model	Serial N°
Pulse generator	EMC partner	Transient 2000	849
Coupling network	Schaffner	CDN 116	149 9318

6 EUT PHOTOS



aesys
Made in Italy
CE





End of report